



Building Operator Certification – Level I



*A Partnership of the
NYC Department of Education
Division of School Facilities,
International Union of Operating
Engineers, and the
City University of New York*



Class 19

Objectives

- Class 19: Review of IAQ and Preventive Maintenance
- Class 20: Review of HVAC Systems and Controls
- Review Chapters 3, 7, 9, 15
- Understand Homeland Security Issues – Chapter 14
- Review Chapters 11, 12, 13
- Revisit Preventative Maintenance Chapter 10 (Class 4)

Agenda

- **Guidance on the IAQ Certification Exam**
- Review Game – Chapters 3, 7, 9, 15
- Homeland Security – Chapter 14
- CD Review Exercise – Chapters 11, 12, 13
- Practical Project Peer Review
- Review of Preventative Maintenance including FORMS – Ch 10
- CD Review – Chapter 10
- Close & Class Reading Assignments



Review Game – Baseball Diamond

Instructor splits group into 4 Teams

Each Group will answer 1 Question, in turn.

Correct answer will advance the Team to next base.

4 Correct answers are needed for a Home Run.

Mark you baseball diamond to advance your Team.

Rules for the Team at Bat:

You have 3 tries for a right answer - 45 seconds

This is closed book for the Team at Bat

This is open book for the others in room.

Review Game – Baseball Diamond

Complaint Response & Procedures - Chapter 15

- When you receive an IAQ Complaint, what are the main steps to take? Give 3 steps. Recall the diagram that we used in class on Page 319.
- Answer: Respond to person making complaint, document the complaint, investigate in the space, investigate the HVAC system and follow IAQ Complaint Procedures.
- While a complaint is still being worked on, how should you communicate with the person who raised the complaint? Page 321
- Answer: Follow your facility's procedure. Tell the person who raised the complaint to continue to communicate through the normal communication path.

Review Game – Baseball Diamond

Handheld Meter Testing- Chapter 5

- **When do you decide to test for an airborne contaminant? Page 58**
- **Answer: When you want to confirm the presence of a specific contaminant, such as formaldehyde.**
- **What document do you use to list the sources of contaminants in a facility, and how they can move through a building? Page 170**
- **Answer: A Pollutant, Source and Pathway Survey**

Review Game – Baseball Diamond

Prevention - Chapter 9

- **What is a Chemical Inventory Form and what information should you enter on this form?**
Page 159
- **A form to document chemicals and chemical products and how they are used. You should include all products including those that seem benign, such as cleansers, etc. etc**

Review Game – Baseball Diamond

Contaminants and Air Filters Ch 3 & 11

- Name the common airflow pathways for contaminants, including 2 indoor airflow pathways and 2 outdoor to indoor airflow pathways. Page 30
- Answer: List of Indoor Pathways
List of Outdoor to Indoor Pathways
- What is the most common type of air filter and how do they work? Page 215
- Answer: Mechanical Filters contain a fiber that has two purposes: 1. To trap particulate matter, and 2. For the particles to remain attached to the filter medium.

Review Game – Baseball Diamond

Mitigating IAQ Problems - Chapter 15

- What agency or administration at the federal level has standards that apply to IAQ in the workplace and to employers? Page 12
- Answer: OSHA – Occupational Safety and Health Administration
- Name three contaminant control strategies. (actions to take) Page 324
- Answer: Contaminant source control, Modification of HVAC systems, Air cleaning, exposure control, mitigation strategies

Review Game – Baseball Diamond

Mitigating IAQ Problems - Chapter 15

- **What steps can you take to control indoor-air contaminants in the place that they are stored?
Page 326, see the bullet points list**
- **Answers: Isolating contaminants by controlling air pressure relationships,
Installing effective local exhaust at the location of the source,
Avoiding recirculation of air that contains contaminants,
Using air-tightening techniques to maintain pressure differentials, Making sure that doors are closed.**

Review Game – Baseball Diamond

Mitigating IAQ Problems - Chapter 15

- Name the main set of standards that lists ventilation requirements for buildings. Page 326
- ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality
- What is the purpose of testing, adjusting and balancing an HVAC system? Page 97
- Ensures that an air-handling system has the desired operating characteristics. Without testing and procedures, proper verification of air-handling system operation is not possible.



Review Game – Baseball Diamond

HVAC Air Systems – Ch 11

- **What is conditioned air? Page 200**
- **Conditioned air is air that is filtered, clean, heated or cooled to the right temperature, and is at the correct humidity.**
- **What is the difference between inclined-tube manometers and digital manometers? Page 109**
- **Both measure pressure differential and can use pitot tubes. The difference is an inclined-tube is attached to the area to be measured and the digital one is portable.**

Review Game – Baseball Diamond

Contaminants and Prevention Ch 3 & 9

- Name two particle contaminants and their sources.
Page 31
- Answer: Particle contaminants: Asbestos, lead, mold, and fiberglass, dust.
- Name two chemical contaminants and their sources.
Page 158
- Answer: Chemical Contaminants: Adhesives, air fresheners, cleansers, disinfectants, lubricants, paints and coatings, pesticides, solvents, waxes and polishes.
Chemical Sources = Cafeterias, medical offices, science labs, tobacco products, dry cleaning, vacuuming, wet mops.



Review Game – Baseball Diamond

Contaminants & Prevention Ch 6 & 9

- List 4 pieces of information that are on an MSDS
Page 164
- Product Identification, Composition, Hazards identification, first aid measures, fire-fighting measures, accidental release measures, handling and storage, exposure controls....p164/5 for full list.
- What are biological contaminants and name two sources. Page 82
- Answer: Biological contaminants are usually living organisms that can cause harmful health effects when inhaled or swallowed.

Review Game – Baseball Diamond

Mitigating IAQ Problems - Chapter 15

- **What is the best way to assess the results of IAQ control efforts, to decide when a problem is solved?
Page 321**
- **Take measurements of air flow, ventilation rates and air distribution patterns (not just measuring for contaminants in the complaint area).**
- **What are the two ways to provide more outdoor air flow to a space that needs dilution? Page 326**
- **Answer: Increasing the flow of outdoor air can be increased by: 1. Increasing the total supply air flow to the complaint area, and 2. Increasing the proportion of outdoor air.**

Conclusion of Baseball Game

- **The answers that you did not get right –
You need to get these right on the Exam !**
- **Review the Baseball Game “Review Session”
on the BOC website to prepare for the Exam.**
- **Key Terms Sheet – Review Page 2 Now**

Section 2

- **Homeland Security, Chapter 14**
- **CD Review – Group Exercise – Ch 11, 12, 13**
- **Practical Project Peer Review**

Homeland Security – Chapter 14

“CBR” Terminology

- What does “CBR” stand for? Page 293
- What is a “CBR” Attack? Page 294
- Can you name some physical security actions that can act as preventive measures? Page 297

Homeland Security – Chapter 14

Building Layout Issues

- **Securing Outdoor Air Intakes** **Page 299**
- **Extensions for Outdoor Air Intakes** **Page 301**
- **Lobbies, mailrooms and loading docks are easy access areas for the public, and prevention measures are needed in these areas.**

Page 304

Homeland Security – Chapter 14

- **Ventilation & Filtration** **Page 305**
- **Filter types needed for biological particles** **Page 307**
- **Emergency Plans, Policies and Procedures** **Page 311**

Review CD

- **Test Review CD – Chapters 11, 12, 13**
- **In 4 Groups Instructor to ask each team a question each**
- Resources within the Quick Quiz
 - Text Book – Quick Topic Excerpts
 - Illustrated Glossary

Using these resources will prepare you for the IOUE Union “IAQ Certification Exam” and help to raise your score on the Exam.



Practical Project Review

- **Review your Practical Project work with your Peer Group**
- **Compare progress projects and provide constructive feedback on each other's work**
- **Incorporate comments into final revisions for your submission next week**

Section 3

- Review of Preventative Maintenance, Ch 10
- CD Review – Chapter 10
- Class Reading Assignments

Goals of Planned Maintenance

Why do we maintain equipment?

Outcomes from equipment maintenance

Reliability

- Reduce breakdowns, nuisance trips
- Avoid unanticipated outages, emergencies

Extended Life

- To reduce the cost of equipment failures
- To reduce capital equipment replacement budgets

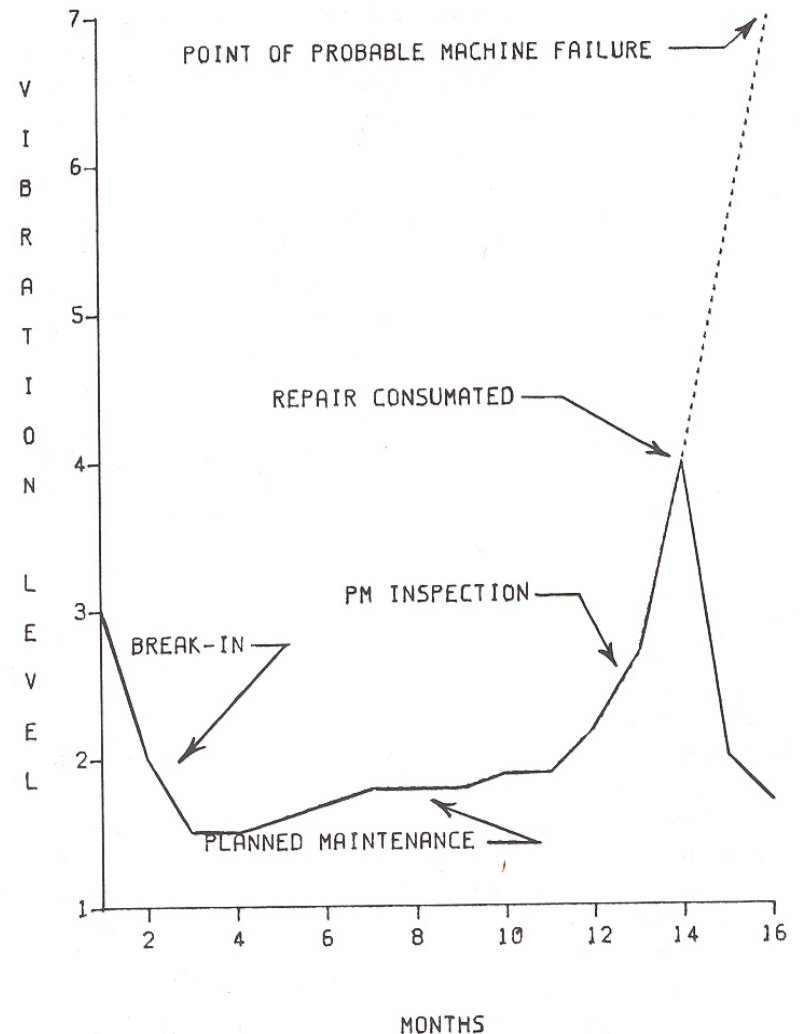
Benefits for the occupants of building

- Increase reliability and comfort of the space
- Better quality of indoor environment

Maintenance Approaches

Corrective Maintenance

- Correct the small problems before they become big problems
- Repairs are made to equipment after a minor failure of equipment.
- Repair Work Orders are written to identify the corrective work to perform.
- Unscheduled maintenance



Maintenance Approaches

Preventive Maintenance

Periodic, scheduled servicing of equipment

- Time periods based on calendar time OR on run-time

Advantages

- Simple to plan
- Routine work orders generated
- Little or no instrumentation

Disadvantages

- All equipment treated equally
- High manpower requirements

Establishing a Preventive Maintenance Program

PM Survey Form –Page 186

- Inventory of all equipment in the facility
- Survey is done to build a Master Equipment List
- Create a record for each piece of equipment, with:
 - Tag No.
 - Location
 - Model No.
 - Serial No.
 - Maintenance requirement

Facility PM Survey Form

Form Number:	Date of Survey:	Name:	
Date of Equipment Purchase:	Equipment Name:		Purchase Price:
Location:	Floor:	System:	
Zone:			
Installing Contractor's Information:			
Address:			
Phone:	Fax:		
Manufacturer Name and Address:			
Phone:	Fax:		
Model Number:	Serial Number:		
Frame:	Type:	Duty Rating:	HP:
Full Load Amps:	Run Amps:	Voltage:	Phase:
Hertz (cycles):	RPM:	Max Ambient Temp.:	Service Factor:
Location of Disconnect:	Panel Fed From and Location:		
Type of Fuses:	Number of Fuses:	Overload Protection:	
Belt Size:	Number of Belts:	Belt Tension:	
Sheave Type and Size:	ID:	OD:	Shaft Size:
Bearing Size:	Bearing Type:	Number of Bearings:	
Greaseable Bearing:	Nongreaseable Bearing:	Condition:	
Other Lubrication:			
Filter Type(s):			
Filter Size:	Number of Filter:	Filter Reading:	



Preventive Maintenance Program

The PM Chart – P190

- Record the maintenance requirements and frequencies, for each piece of equipment
- Bring all requirements together onto a single chart
 - Show weekly, monthly, annual, etc. actions

PM Chart

(PM Tasks to be Performed)

Annual: _____

Biannual: _____

Bimonthly: _____

Monthly: _____

Biweekly: _____

Weekly: _____



Preventive Maintenance Program

PM Work Orders

- To assign the maintenance tasks to the staff
- Includes: task to be done, tools required, parts required, estimated time to perform the task
- Develop a system for generating and assigning Work Orders at appropriate times
 - Manual System - Maintenance Log
 - Computerized Maintenance Mgt System (CMMS)
- Have a system for tracking all Work Orders issued

Work Order Summary

PM Work Order – contains

- Specific PM tasks to be performed
- Tools and supplies needed for the task
- Regularly scheduled interval for the PM
(Weekly, Monthly, Quarterly, Annually)

PM Work Order is Completed – then it goes ...

- One copy goes to Equipment History Record
- One copy goes to Chief Engineer (CE)

Corrective Work Orders

Corrective Work Orders = Repair Work Orders

- Break-down work
- Complaint response
- Corrective work (repairs)

These are used in a facility by:

- Requested by anyone in the facility
- Request goes to the facility management
- Walk through inspection by facility manager
- Any type of equipment: water fountain to walls, to structural problems or foundation

Preventive Maintenance Program

Equipment History Record

A system of files and records with the reference information for all equipment and the history of work performed.

- Master Equipment List
- Operating Manuals & Manufacturer Data
- Equipment History File

CD Review: Chapter 10

- **Test Review CD**

- **Resources within the Quick Quiz**
 - Text Book – Quick Topic Excerpts**
 - Illustrated Glossary**

Using these resources will prepare you for the IOUE Union “IAQ Certification Exam” and help to raise your score on the Exam.



Class Reading Assignments

- Practical Projects are due next week – Week 20
- Review the Baseball Game “Review Session” on the BOC website to prepare for the Exam.
- Reading Assignment: Review for the IAQ Exam
Class 19 & 20 Presentations
- Readings in IUOE Indoor Air Quality Solutions are extremely important for taking the union certification exam
- Use the “Test review CD” that is at the back of the book for study and practice purposes

